

PATENT SPECIFICATION

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Inventors:—JOHN OLIVER MARSH and DANIEL SEED.



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International Classification:—F01d. F04d.

COMPLETE SPECIFICATION.

Improvements in or relating to Inflation Apparatus.

We, THE WALTER KIDDE COMPANY LIMITED, a British Company, of Belvue Road, Northolt, Greenford, Middlesex, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to inflation apparatus intended for the larger sizes of inflation bags, such as inflatable tents.

In our co-pending British Application No. 8960/55 (Serial No. 788,555) there is already described an inflation device comprising an axial flow turbine located within multi-stage axial fan.

An inflation bag of the type referred to above may be required to be inflated very rapidly under emergency conditions, and for this purpose is inflated by release of gas from a supply of gas stored under pressure. The storage of gas under pressure involves not only the weight of the compressed gas itself but also the weight of the storage bottles.

The purpose of the inflation device described in our said co-pending Patent Application is to utilise the energy of the gas stored under pressure to draw air into the inflation bag from the surrounding atmosphere, thus reducing the weight of the gas storage required to inflate the inflation bag.

The object of the present invention is to provide an alternative form of device to that described in our co-pending Patent Application, the device of the present invention being simpler to manufacture and possibly of less weight than the device described previously.

According to the present invention an inflation device comprises a stationary body adapted to be secured in the wall of an inflation bag, an impulse turbine wheel mounted for rotation in said body, a centrifugal

impeller driven by said turbine wheel, a valve arranged between the impeller and the turbine wheel and a gas jet nozzle adapted to direct gas from the high pressure supply onto the turbine wheel.

One construction of device made in accordance with the invention is hereinafter described with reference to the drawings accompanying the Provisional Specification, wherein:

Figure 1 is a section through the inflation device.

Figure 2 is a plan view of the centrifugal compressor portion of the device.

Figure 3 is a section through the turbine.

The apparatus comprises a turbine wheel 1 secured to a shaft 2, supported on bearings 3 in a turbine casing 4 which forms part of the stationary body structure of the device. The turbine wheel 1 is adapted to be driven by the impact of gas under pressure delivered through a jet nozzle (see Figure 3) located in the casing 4, the nozzle 5 being connected by a pipe 6 to gas bottles or other high pressure gas supply (not shown).

The turbine unit thus described is supported by a back plate 7, which is in turn secured to the housing 8 of the centrifugal compressor. The housing 8 serves as the main support for the whole inflation device, as it is secured in the wall 9 of the inflation bag by means of a ring 10.

The impeller 11 of the centrifugal compressor is secured to the turbine wheel shaft 2 and has steeply raked ribs 12. The impeller 11 is positioned within the body 8 co-axially with an inlet aperture 14. The impeller 11 is dished and has a dish-like flexible valve member 15 secured to its rear face. The valve member 15 rests lightly against an annular rib 16 on the body 8 when there is no pressure built up in the inflation bag. When

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the impeller 11 is rotated at a sufficient rate, the pressure built up by it forces air past the valve member 15 into a diffuser comprising a plurality of blades 17 arranged between the

5 In order to operate with maximum efficiency a gear train may be provided between the turbine and centrifugal impeller. It will be appreciated that as soon as the impeller 11 drops to a speed at which it is incapable of forcing further air past the valve 15, there will be a sharp closure of the valve by reason of the pressure differential on its two faces. The sharpness of cut-off will be augmented by a braking action on the rotor structure caused by partial engagement of the valve member with its seating, thus increasing the pressure difference between the two faces of the flexible valve member. The sharpness of valve cut-off prevents substantial leakage of gas back past the valve before it is fully closed.

WHAT WE CLAIM IS:—

1. An inflation device comprising a stationary body adapted to be secured in the wall of an inflation bag, an impulse turbine wheel mounted for rotation in said body a centrifugal impeller driven by said turbine wheel, a valve arranged between the impeller and the turbine wheel and a gas jet nozzle adapted to direct gas from the high pressure supply onto the turbine wheel.

2. An inflation device according to Claim 1, comprising an impeller housing adapted to be secured in the wall of an inflation bag, said

impeller housing having an inlet aperture therein, a turbine casing secured to and spaced from the impeller housing, a turbine wheel carried on a shaft mounted in the casing, an end of the shaft projecting through the wall of the turbine casing, a centrifugal impeller member secured to the projecting end of the turbine shaft and positioned between the impeller housing and the turbine casing, the said impeller carrying a flexible valve disc on its rear face to seal against the impeller housing when the impeller is at rest and the turbine wheel being rotatable by means of a stream of gas under pressure directed onto it by a jet nozzle positioned close to it.

3. An inflation device according to Claim 2, wherein the flexible disc is dished.

4. An inflation device according to Claim 2 or 3, wherein the rear face of the impeller housing has a central area of a shape corresponding to the shape of the space swept by the impeller, a rib surrounding the central area to co-operate with the flexible valve disc and a series of curved diffuser blades arranged outwardly of the rib.

5. An inflation device constructed and adapted to operate substantially as herein described with reference to the drawings accompanying the Provisional Specification.

STEVENSON, LANGNER, PARRY
& ROLLINSON.

Chartered Patent Agents,
Agents for the Applicants.

PROVISIONAL SPECIFICATION.

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The purpose of the inflation device described in our said co-pending Patent Applica-

tion is to utilise the energy of the gas stored under pressure to draw air into the inflation bag from the surrounding atmosphere, thus reducing the weight of the gas storage required to inflate the inflation bag.

The object of the present invention is to provide an alternative form of device to that described in our said co-pending Patent Application, the device of the present invention being simpler to manufacture and possibly of less weight than the device described previously.

According to the present invention an inflation device comprises a stationary body adapted to be secured in the wall of an inflation bag, an impulse turbine wheel mounted for rotation on said body, a centrifugal impeller mounted on the shaft of said turbine wheel, a valve arranged between the impeller and the turbine wheel and a gas jet nozzle adapted to deliver gas from the high pressure supply to the turbine wheel.

One construction of device made in accordance with the invention is hereinafter

described with reference to the accompanying drawings, wherein :—

Figure 1 is a section through the inflation device.

5 Figure 2 is a plan view of the centrifugal compressor.

Figure 3 is a section through the turbine.

The apparatus comprises a turbine wheel 1 secured to a shaft 2, supported on bearings 3 10 in a turbine casing 4 which forms part of the stationary body structure of the device. The turbine wheel 1 is adapted to be driven by the impact of gas under pressure delivered through a jet nozzle 5 located in the casing 4, 15 the nozzle 5 being connected by a pipe 6 to gas bottles or other high pressure gas supply (not shown).

The turbine unit thus described is supported by a back plate 7, which is in turn 20 secured to the housing 8 of the centrifugal compressor. The housing 8 serves as the main support for the whole device, as it is secured in the wall 9 of the inflation bag by means of a ring 10.

25 A centrifugal impeller 11 is also secured to the shaft 2 and has steeply raked ribs 12. The impeller is positioned within the body 8 in front of an inlet aperture 14. The impeller

11 is dished and has a dish-shaped flexible valve member 15 secured to its rear face. The 30 valve member 15 ordinarily seats against an annular rib 16 on the body 8, but when the impeller 11 is rotated at a sufficient rate, the pressure built up by it causes the valve to lift and permits air to pass through into a 35 diffuser comprising a plurality of blades 17 arranged between the body 8 and the back plate 7. The purpose of the diffuser is to transform the velocity of the air into pressure.

In order to operate with maximum efficiency a gear train may be provided between 40 the turbine and centrifugal impeller. It will be appreciated that as soon as the impeller 11 drops to a speed at which it is incapable of forcing further air past the valve 15, the 45 closure of the valve will be accompanied by a braking action on the rotor structure, so that there will be a sharp cut-off action on the valve, preventing leakage of gas back past the 50 valve before it is fully closed.

STEVENS, LANGNER, PARRY
& ROLLINSON.

Chartered Patent Agents,
Agents for the Applicants.

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PROVISIONAL SPECIFICATION

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the Original on a reduced scale.

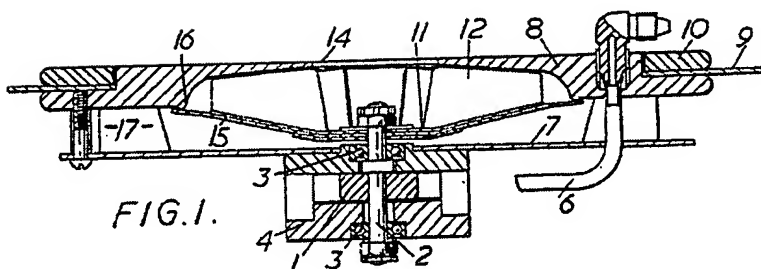


FIG. 1.

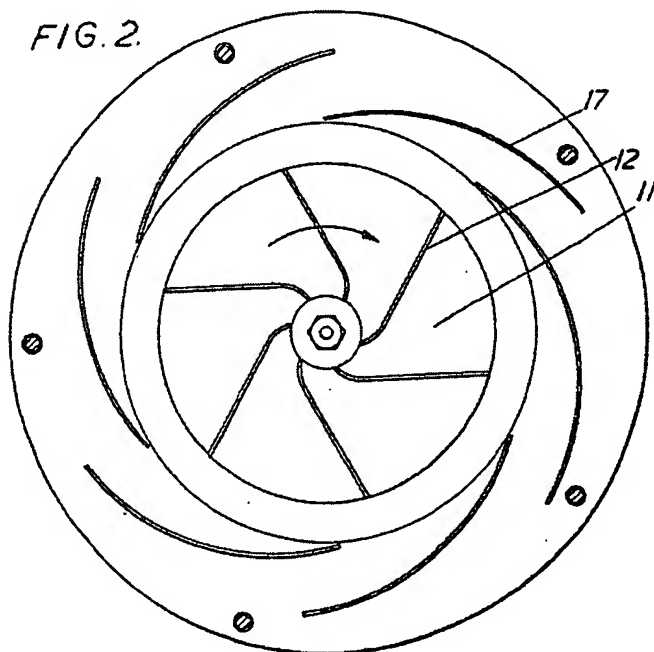


FIG. 2.

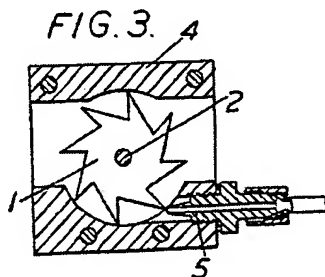


FIG. 3.

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